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DESIGN OF HYBRID GROUND NUT OIL EXTRACTOR

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ABSTRACT

This paper discusses the importance of human power from the earliest times to the present and its future scope. As the use of natural fuel is increased due to industrial development, its storage going to end. More effective use of human power can do by using mechanisms. The technology used to transmit human power to the working unit is termed as human powered machine. The appropriate and most effective technology to use human power efficiently is bicycle technology. In bicycle technology the operator uses the pedal to operate the machine and transmits power through crank, chain and freewheels to the working unit. This machine widely can be used to generate electric power, to operate various home appliances, to drive water pump, harvesting activities in agriculture and for physical fitness.The oil seed presser is used to draw oil out of locally produced seeds and to be economical for production of oil on small scalethe design and development in the screw presser design to increase the output is the objective of project

KEYWORDS: Screw Presser, Human Power, and Oil Seed

INTRODUCTION

Some engineers developed human powered process machines which energized process units needing 2 to 5 kW and which have intermittent operation. This machine system comprised of subsystems; energy unit, mechanical power transmission system and process unit. Energy unit comprised of an arrangement similar to a bicycle, a speed raising gear pair. Recently Modak (2001) has proposed the concept which gave an idea about when to use human powered as an energy source or on load operation of the process unit depending on the operating characteristic of the process unit.

Various Method of Extraction of Oil

Distillation

An age old practice, distillation is believed to have its roots well laid in the 8th century. The most popular amongst other essential oil extraction methods, it is mostly used for leaves, flowers, seeds, roots, and stems. The technique of low pressure produces the best quality of essential oil for aromatherapy purposes. For the process, two large containers are used. The first container is filled with aromatic raw materials and steamed water, heated at low pressure, is made to pass through it.

Expression

This method is usually used for extraction of essential oils from their fruit. It is basically a cold pressed method of extraction. Mainly essential oils extracted from citrus fruit, such as lemon, mandarin, bergamot and lime, make use of this process.

Effleurage

The process involves the use of fixed oil, such as oil, animal fat or lard. For the process, a sheet of glass layered with fixed oil is mounted on a wooden rack. The raw materials and flower petals are placed on the glass, which is later exposed to sun. The heat of the sun causes saturation of the fixed oil, with essential oil of the raw materials. This fixed oil is then dissolved in alcohol. Later on, alcohol is evaporated, giving rise to pure essential oil

Maceration

The method of maceration is almost same as that of effleurage. The only difference between the two is that while the latter uses natural heat (i.e. heat from the sun) for the process, in maceration, fixed oil is artificially heated to facilitate the release of essential oil.

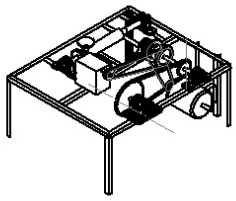

Figure 1: Diagram of Oil Seed Presser

- Paddles 2. Sprocket wheel 3. Roller chain 4. Free wheel with smaller sprocket 5.Bearing 6. Gear 7. Pinion

Solvent Extraction

In this method, flower petals are kept on perforated metal trays and sprayed with the solvent. This solvent gets absorbed by the flowers and makes them release their essence. Alcohol is then added to extract the essence. Though the oil extracted from this method is also termed as 'absolute', the process is slightly less expensive

Extraction of Oil By Oil Seed Pressure

The Human Power Flywheel Motor can be used to extract oil from seeds for a small scale quantity. Thus human mechanical power can be used to extract oil from various seeds at a lower scale and can be used for domestic purposes.

The oil seed pressure utilizes the human power for extraction purpose.

OBJECTIVES

- Design and development of oil seed press for groundnut seeds
- To evaluate the performance of the newly developed screw press during field trials.
- To continue technical developments in optimizing the screw design for screw press Model.

METHODOLOGY

The Screw press is basically a helical screw mounted on a conical shaft supported by bearing with the shaft rotating in a stationary cylindrical barrel. As the shaft rotates the screw towards the discharge end of the assembly moves the oil seed that is fed through the hopper inlet where it is pressed. The oil expressed is discharged through perforation in

the barrel bottom and the cake is discharged at the unclosed end of the barrel.

In addition to it is performing the two operation of oil seed milling and oil expressing simultaneously, with a small quantity of oil seed and satisfying the performance requirement, the constructed screw press should be simple in design and easy to fabricate, be usable by anybody, even without previous technical training.

Design of the Screw Press

The Screw press was designed using basic engineering principles Details of the design philosophy and calculations for the machines are given in appendix A

Table 1: Specification of Major Component of Oil Screw Press

Base Diameter of Screw Shaft	30 mm
Max diameter of screw shaft	46 mm
Length of taper	100 mm
Angle of taper	1.43 º
Diameter of barrel	48 mm
Speed of rotation	700 rpm

The Screw Press Operation

Continuous pressing by means of expellers (also known as screw press) is a widely applied process for the extraction of oil from oil seeds and nuts. It replaces the historical method for the batch wise extraction of oil by mechanical or hydraulic pressing. The expeller consists of a screw (or worm), rotating inside a cylindrical cage (barrel). The material to be pressed is fed between the screw and barrel and propelled by the rotating screw in a direction parallel to the axis. The configuration of the screw and its shaft is such that the material is progressively compressed as it moves on, towards the discharge end of the cylinder. The compression effect can be achieved, for example by decreasing the clearance between the screw shaft and the cage (progressive or step-wise increase of the shaft diameter) or by reducing the length of the screw flight in the direction of the axial movement. The gradually increasing pressure releases the oil which flows out of the press through the slots provided on the periphery of the barrel, while the press cake continues to move in the direction of the shaft, towards a discharge gate installed at the other extremity of the machine.

CONCLUSIONS

From above discussion it can be concluded as

- Human power is easy to use and no need of special training.
- As no combustion of fuel takes place so no air pollution.
- Human powered machines can be manufactured locally.
- Low initial and maintenance cost.
- Self-dependent source of energy.
- Best alternative source of energy.

Appendix Design of Screw Press

Design of rotating tapered shaft

Consider the Material for shaft (C-20)

$\Sigma y = 26$

$= 260$

Let the factor of safety (FOS) = 3.

Now,

Bending stress is given by

$[\sigma_b] =$

$= 260/3$

$= 86.67$

The tensional shear stress is given by,

$\tau =$

$=$

$\tau = 43.33$

Energy is given by,

$E = \times I \times \omega^2$

Assume maximum speed of the shaft N=700rpm

$\omega =$

$=$

$= 73.30 rad/sec$

Moment of Inertia of Flywheel is given by

$I = m \times K^2$

Where,

Mass of flywheel m=38Kg

K = Radius of Gyration

D = Diameter of flywheel = 80cm

K = r =.

K = 40cm = 0.4m

$I = m \quad K^2$

$I=38\times0.4^2$

$I =6.08$ Kg-m^2.

Energy is given by:

$E = . \times I\times\omega^2$

$E =. \times6.08\times73.30^2$

E =160.23×103 N-m

E = P = 2.670 KWatts

Now, torque is given by:

Torque =.

= 2670.54/73.30

T =36.39N-m

The twisting moment of shaft is calculated as

Twisting moment (T_e) =

Neglecting Moment i.e. M = 0

T_e= T

T_e=

36.39×10^3=.

d = 16.23mm

d ~ 20mm.

Hence, the diameter of the shaft taken is 30 mm.

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